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(54) Title: AN ADJUVANT COMPOSITION FOR USE WITH HERBICIDES, PESTICIDES, INSECTICIDES, OVICIDES AND FUNGICIDES AND METHOD OF APPLICATION

(57) Abstract: An adjuvant for use with systemic herbicides, pesticides, insecticides, ovicides and fungicides and method of application on animals, birds, trees, plants, fruits and vegetables to enhance the action and effect of systemic herbicides, pesticides, insecticides, ovicides and fungicides with which the adjuvant is combined wherein the adjuvant comprises at least one surfactant and at least one high terpene containing natural oil.

## **DESCRIPTION**

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### **Adjuvant Composition For use With Herbicides, Pesticides, Insecticides, Ovicides And Fungicides And Method Of Application**

#### **Technical Field**

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An adjuvant for use with systemic herbicides, pesticides, insecticides, ovicides and fungicide on animals, birds, plants, trees, fruits and vegetables.

#### **Background Art**

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Various insects such as lice, ticks, mites and aphides attack untreated and unprotected trees and plants. Moreover, fungi left uncontrolled can damage and even destroy plants and trees including crops associated therewith.

In the past, various oils have been used to control insects and mites. Recently, however, renewed attention has focused on the use of oils as a natural substitute for traditional insecticides with attendant toxic and other dangerous side effects.

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These oils include horticultural oils that are highly refined petroleum products than can be mixed with water for application for control of target insect and mite pests without deleterious effects. Modern horticultural oils do not include vegetable, fish or whale oils.

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Horticultural spray oils are the low toxicity alternative to broad-spectrum insecticides. Since the mechanism of insect and mite control with spray oils is by suffocation and/or repellency of egg laying females, there is no requirement for the

addition of toxic chemicals. These properties are a valuable and well-recognized component of the practice of integrated pest management where oil spraying is intrinsically linked to natural control of pests by predators and parasitoids. Horticultural spray oils are formulated on highly refined clear oil with a minimum of nonionic surfactant. Independent environmental impact studies have shown that D-C-TRON has no detrimental effect on the environment. Mammalian toxicity studies published in the American Journal of Industrial Medicine have shown that oils at this refinement level are non-toxic and non-carcinogenic.

Generally, oil sprays are safe to humans. These oil sprays have little, if any, negative effect on wildlife and non-target insects in the environment. Furthermore, oil sprays are less toxic due to the method by which they kill target pests. In particular, the thin film of oil covers the target insect or mite and plugs the spiracles or pores through which the pests or parasites breathe. The cause of death is primarily suffocation. Large, motile insects and animals that breathe by another method are not affected by these oils.

Another advantage of oil applications is the absence of objectionable odors. In addition, oils are relatively inexpensive and significantly less expensive than many insecticides.

Unfortunately, there are limitations to the use of oil treatments. For example, oils are only effective against those pests that are thoroughly coated by the spray solution. This usually means that only small, immobile or slow moving pests that are exposed on the surface of the plant or tree at the time of application will be controlled.

Since oil sprays only work by contracting and covering the target pest, thorough application is essential. Missed surface areas provide a safe refuge for the target pests.

U.S. 6,258,369 and U.S. 6,277,389 disclose a non-toxic aqueous pesticide for application on plants and animals comprising at least one surfactant and at least one  
5 high terpene containing natural oil. The pesticide is used to effectively control insects and parasites such as darkling beetles, lice, ticks, mites, flies, aphides, mosquitoes and chiggers found on plants and animals.

U.S. 5,693,344 shows a hazard-free method for controlling insects using a non-toxic composition in the form of a fragrance and crystalline particles which puncture  
10 directly through the exoskeleton of an insect. In operation, the particles work themselves between the insect's protective body plates and then puncture the exoskeleton permitting entry of the fragrance into the body of the insect. Once inside, the particles absorb up to four times their weight of the vital body fluids of the insect and the fragrance has a neural effect on the insect.

U.S. 5,143,939 shows a method of treating soil and agricultural crops for  
15 controlling worms and nematodes comprising a nonionic surfactant, namely an alkyloxypolyethyleneoxyethanol used as the sole active ingredient to control fungus, mites, worms, termites, nematodes and other insects.

U.S. 4,379,168 relates to pesticides containing d-limonene as an insect-killing  
20 ingredient with surfactants or emulsifiers and water. The pesticide compositions are liquids designed for use as a dip to rid small animals of fleas and ticks, a spray to kill fleas and ticks on small animals and in the kennels of small animals; a spray to kill flies

on small animals and in the kennels of small animals; and a spray or liquid to rid household areas of cockroaches and other insect pests.

5 U.S. 6,248,710 B1 discloses a water-soluble or water-dispersible material for deposition onto a fabric substrate during a treatment process comprising polysaccharide structure having at least one substituent benefit agent group and optionally, one or more other substituent groups. The polysaccharide structure has one or more regions with at least 3, preferably at least 4 consecutive unsubstituted saccharide rings.

10 Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this application.

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#### **Disclosure of Invention**

Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

20 In a first aspect, the present invention provides an adjuvant composition comprising: from 20 per cent to 34 per cent surfactant and from 2 per cent to 8 per cent terpene-containing natural oil, said terpene-containing natural oil having a terpene content of at least 50 per cent, all by weight;

25 wherein said adjuvant composition is diluted with an herbicide composition, a pesticide composition, an insecticide composition, an ovicide composition or a fungicide composition at a ratio of from 1/2 part to 8 parts adjuvant composition to 1000 parts said herbicide composition, pesticide composition, insecticide composition, ovicide composition or fungicide composition and water.

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In another aspect, the present invention provides a method of controlling pests, insects or fungi by applying a composition according to the first aspect of the invention.

The present invention relates to an adjuvant formulated for use on animals, birds, plants, trees, fruits and vegetables as an adjuvant in combination with systemic herbicides, pesticides, insecticides, ovicides and fungicide. The composition comprises at least one surfactant and at least one high terpene. The invention also includes the method of  
5 application of the composition.

High terpene containing natural oil as used herein means those natural oils having a terpene content of at least 50 per cent. It is preferable that the high terpene natural oil contains at least 65 per cent. Suitable high terpene containing natural oils includes oil  
10 from conifers such as citrus peel oils, preferably orange oil, grapefruit oil, lemon oil or pine oil. Of these, orange oil is preferred, and cold pressed orange oil the most preferred. The preferred terpene content is from about 80 per cent to about 90 per cent and most preferred from about 85 per cent to about 87 per cent, all by weight.

15 The amount of high terpene containing natural oils in the composition depends upon the amount of terpenes in the specific oil used. Generally, the composition

contains from about 2 per cent by weight to about 8 per cent by weight of high terpene containing natural oil, preferably about 5 per cent by weight.

Anionic and nonionic surfactants are acceptable for use in the composition of the present invention. Anionic surfactants such as salts of fatty acids, alkyl sulphates, 5 alkyl ether sulphonates and alkyl aryl sulphonates are preferred.

The composition may also contain preservatives, pH neutralizers and/or clarifiers or stabilizers. The balance of the composition is water.

In use, the adjuvant, when combined with systemic herbicides, pesticides, insecticides, ovicides and fungicides, is diluted and sprayed or misted on animals, birds, 10 plants, trees, fruits or vegetables.

When so applied, the composition is effective as an adjuvant in enhancing the effect of systemic herbicides, insecticides, ovicides and fungicides that are applied to control various diseases, pests and insects including darkling beetles, lice, ticks, mites, flies, aphides, thrips, mealybugs, mosquitoes and chiggers.

15 The composition is also effective as an adjuvant in enhancing fungicides in controlling fungi. While not to be bound by theory, absorption of fungicide, once blended with the adjuvant, is increased both in speed as well as percentage absorbed.

Finally, the composition as an adjuvant enhances water penetration and absorption by the soil as well as decreases water logging. These better soil conditions 20 lead to improved root and plant growth.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts that will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

**Best Mode for Carrying Out the Invention**

The present invention relates to an adjuvant for use with systemic herbicides, pesticides, insecticides, ovicides and fungicides formulated for use with various animals, birds, trees, plants, fruits and vegetables. The composition comprises at least one  
5 surfactant and at least one high terpene containing oil to enhance the effectiveness of pesticides, insecticides, ovicides and fungicides in controlling pests, insects and fungi. The invention also includes the method of application of the composition. Furthermore, the composition may be used as an adjuvant with contact pesticides.

High terpene containing natural oil as used herein means those natural oils  
10 having a terpene content of at least about 50 per cent. It is preferable that the high terpene natural oil contains at least about 65 per cent. Suitable high terpene containing natural oils includes oil from conifers such as citrus peel oils, preferably orange oil, grapefruit oil, lemon oil or pine oil. Of these, orange oil is preferred and cold pressed orange oil the most preferred. The preferred terpene content is from  
15 about 80 per cent to about 90 per cent and most preferred from about 85 per cent to about 87 per cent, all by weight.

The amount of high terpene containing natural oils in the composition depends upon the amount of terpenes in the specific oil used. Generally, the composition contains from about 2 per cent by weight to about 8 per cent by weight of high terpene  
20 containing natural oil, preferably about 5 per cent by weight.

Anionic and nonionic surfactants are acceptable for use in the composition of the present invention. Anionic surfactants such as salts of fatty acids, alkyl sulphates, alkyl ether sulphonates and alkyl aryl sulphonates are preferred. Examples of such

surfactants may include from about 8 per cent to about 12 per cent sulfonic acid, preferably about 10 per cent sulfonic acid; from about 5 per cent to about 9 per cent sodium laurel sulfate, preferably about 6.8 per cent sodium laurel sulfate; from about 6 per cent to about 10 per cent alcohol ethoxylate, preferably about 8.2 per cent alcohol ethoxylate; and from about 1 per cent to about 3 per cent olefin sulfonate, preferably about 1.7 olefin sulfonate, all by weight.

Generally, the composition contains from about 20 per cent to about 34 per cent surfactant(s), preferably from about 25 per cent to about 30 per cent surfactant(s) and most preferably about 26.7 per cent surfactant(s), all by weight.

The composition may also include butylated hydroxytoluene, p-Hydroxybenzoic acid and/or sodium tetraborate decahydrate. The range of butylated hydroxytoluene is from about 0.05 per cent to about 0.15 per cent and preferably about 0.10 per cent, all by weight. The range of sodium tetraborate decahydrate is from about 0.89 per cent to about 1.09 per cent and preferably about 0.99 per cent, all by weight. The range of p-Hydroxybenzoic acid is from about 0.25 per cent to about 0.35 per cent and preferably about 0.30 per cent, all by weight. Generally, the composition contains from about 1.39 per cent to about 1.89 per cent preservative(s), preferably about 1.64 per cent preservative(s), all by weight.

In addition, a bactericide is from about 0.05 per cent to about 0.15 per cent and preferably about 0.10 per cent, all by weight may be added.

Caustic crystals such as sodium hydroxide may be added in an amount of from about 1.25 per cent to about 1.37 per cent by weight to neutralize the composition to a pH of from about 7.75 to about 9.

A clarifier or stabilizer such as urea may be added in an amount of from about 0.59 per cent to about 0.99 per cent and preferably about 0.79 per cent, all by weight.

The balance of the composition is made up by water.

The preferred composition comprises about 5 per cent cold pressed orange oil,  
5 about 6.8 per cent sodium lauryl sulfate, about 8.2 per cent of alcohol ethoxylate,  
about 1.7 per cent sodium olefin sulfonate, about 10 per cent dodecylbenzene  
sulphonic acid, about 0.1 per cent antioxidant such as butylate hydroxytoluene, about  
0.30 per cent preservative such as p-Hydroxybenzoic acid, about 0.1 per cent  
bactericide, about 0.99 per cent fungicide such as sodium tetraborate decahydrate,  
10 about 0.79 per cent clarifier such as urea and about 1.31 per cent neutralizer such as  
sodium hydroxide with the balance a diluent such as water, all by weight.

In use, the adjuvant composition is combined with a herbicide, pesticide,  
insecticide, ovicide or fungicide effective as either a contact or systemic herbicide,  
pesticide, insecticide, ovicide or fungicide. An effective range for the adjuvant  
15 composition is from about 1/2 part to about 8 parts adjuvant to 1000 parts herbicide,  
pesticide, insecticide, ovicide or fungicide and water. The preferred range for the  
adjuvant composition is from about 1 1/2 parts to about 4 parts adjuvant composition  
to 1000 parts herbicide, pesticide, insecticide, ovicide, fungicide. The preferred  
concentration of adjuvant concentration is about 2 parts adjuvant composition to 1000  
20 parts herbicide, pesticide, insecticide, ovicide or fungicide.

The combined adjuvant composition and herbicide, pesticide, insecticide, ovicide  
or fungicide is applied to plants or row crops such as most vegetables at an application  
rate of about five (5) liters or less per acre.

The combined adjuvant composition and herbicide, pesticide, insecticide, ovicide or fungicide is applied to trees or orchards at an application rate of about eight (8) liters or less per acre.

While the invention has been described above with respect to certain  
5 particular embodiments thereof, numerous other forms and modifications will be apparent to those skilled in the art. The appended claims and the invention generally should be construed as covering all such obvious forms and modifications that are within the true spirit and scope of the invention.

It will thus be seen that the objects set forth above, among those made  
10 apparent from the preceding description are efficiently attained and since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of  
15 the generic and specific features of the invention herein described, and all statements of the scope of the invention that, as a matter of language, might be said to fall therebetween.

Now that the invention has been described,

## CLAIMS:

1. An adjuvant composition comprising:  
from 20 per cent to 34 per cent surfactant and from 2 per cent to 8 per cent terpene-  
containing natural oil, said terpene-containing natural oil having a terpene content of at  
5 least 50 per cent, all by weight;  
wherein said adjuvant composition is diluted with an herbicide composition, a  
pesticide composition, an insecticide composition, an ovicide composition or a  
fungicide composition at a ratio of from 1/2 part to 8 parts adjuvant composition to  
1000 parts said herbicide composition, pesticide composition, insecticide composition,  
10 ovicide composition or fungicide composition and water.
2. The adjuvant composition of Claim 1 wherein said adjuvant composition  
contains from 25 per cent to 30 per cent surfactant, by weight prior to dilution with said  
herbicide composition, pesticide composition, insecticide composition, ovicide  
15 composition or fungicide composition.
3. The adjuvant composition of Claim 1 wherein said adjuvant composition  
contains 27 per cent surfactant and 5 per cent terpene containing natural oil, all by  
weight prior to dilution with said herbicide composition, pesticide composition,  
20 insecticide composition, ovicide composition or fungicide composition.
4. The adjuvant composition of any one of claims 1-3 wherein said surfactants  
comprises sulfonic acid, sodium laurel sulfate, alcohol ethoxylate and olefin sulfonate.
- 25 5. The adjuvant composition of any one of claims 1-4 wherein said surfactant  
comprises from 8 per cent to 12 per cent sulfonic acid; from 5 per cent to 9 per cent  
sodium laurel sulfate; from 6 per cent to 10 per cent alcohol ethoxylate and from 1 per  
cent to 3 per cent olefin sulfonate, all by weight prior to dilution with said herbicide  
composition, pesticide composition, insecticide composition, ovicide composition or  
30 fungicide composition.
6. The adjuvant composition of any one of claims 1-5 wherein said surfactants  
comprises 10 per cent sulfonic acid; 6.8 per cent sodium laurel sulfate; 8.2 per cent  
alcohol ethoxylate; and 1.7 per cent olefin sulfonate, all by weight prior to dilution  
35 with said herbicide composition, pesticide composition, insecticide composition,  
ovicide composition or fungicide composition.

7. The adjuvant composition of any one of claims 1-6 wherein said adjuvant composition comprises sodium tetraborate decahydrate.
- 5 8. The adjuvant composition of any one of claims 1-7 wherein said adjuvant composition comprises from 0.89 per cent to 1.09 per cent sodium tetraborate decahydrate, by weight prior to dilution with said herbicide composition, pesticide composition, insecticide composition, ovicide composition or fungicide composition.
- 10 9. The adjuvant composition of any one of claims 1-8 wherein said adjuvant composition comprises 0.99 per cent sodium tetraborate decahydrate, by weight prior to dilution with said herbicide composition, pesticide composition, insecticide composition, ovicide composition or fungicide composition.
- 15 10. The adjuvant composition of any one of claims 1-9 wherein said adjuvant composition has a pH of from 7.75 to 9.
11. The adjuvant composition of any one of claims 1-10 comprising from 1.25 per cent to 1.37 per cent sodium hydroxide, by weight prior to dilution with said herbicide composition, pesticide composition, insecticide composition, ovicide composition or fungicide composition.
- 20 12. The adjuvant composition of any one of claims 1-4 wherein said adjuvant composition comprises 5 per cent cold pressed orange oil, 6.8 per cent sodium lauryl sulfate, 8.2 per cent of alcohol ethoxylate, 1.7 per cent sodium olefin sulfonate, 10 per cent dodecylbenzene sulphonic acid and 0.99 per cent sodium tetraborate decahydrate, all by weight prior to dilution with said herbicide composition, pesticide composition, insecticide composition, ovicide composition or fungicide composition.
- 25 13. The adjuvant composition of any one of claims 1-12 wherein said adjuvant composition comprises from 0.59 to 0.99 per cent urea by weight.
- 30 14. The adjuvant composition of any one of claims 1-13 wherein said adjuvant composition is diluted with said herbicide, pesticide, insecticide, ovicide or fungicide at a ratio from 1 1/2 part to 4 parts adjuvant composition to 1000 parts said herbicide, pesticide, insecticide, ovicide or fungicide.
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15. The adjuvant composition of any one of claims 1-14 wherein said adjuvant composition comprises from 0.05 per cent to 0.15 per cent butylated hydroxytoluene by weight prior to dilution with said herbicide composition, pesticide composition, insecticide composition, ovicide composition or fungicide composition.  
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16. The adjuvant composition of any one of claims 1-15 wherein said adjuvant composition comprises 0.10 per cent butylated hydroxytoluene by weight prior to dilution with said herbicide composition, pesticide composition, insecticide composition, ovicide composition or fungicide composition.  
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17. The adjuvant composition of any one of claims 1-16 wherein said adjuvant composition is diluted with said herbicide, pesticide, insecticide, ovicide or fungicide at a ratio of 2 parts adjuvant composition to 1000 parts said herbicide, pesticide, insecticide, ovicide or fungicide and water.  
15
18. A method of controlling pests, insects or fungi by applying a composition according to any one of the preceding claims.
- 20 19. The method of Claim 18 wherein said adjuvant composition is applied at a rate of 5 liters or less per acre on plants and row crops.
20. The method of Claim 18 wherein said adjuvant composition is applied at a rate of 8 liters or less per acre on trees and orchards.  
25
21. The method of any one of claims 18-20 wherein said adjuvant composition is sprayed or misted on animals, birds, plants, trees, fruits or vegetables.
22. An adjuvant composition substantially as hereinbefore described.  
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23. A method of applying an adjuvant composition to a target plant substantially as hereinbefore described.